

Global Research Trend on Web 2.0 Usage among Higher Learning Institution Educators: A Bibliometric Analysis of the Recent Decade

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This study, which focuses on the utilization of Web 2.0 in higher education, provides a comprehensive analysis of all document types found in the Scopus database between 2006 and 2022, with a cut-off date of February 15, 2023. A total of eight hundred five relevant documents from the Scopus database between 2006 and 2022 were analyzed, with a specific focus on the use of Web 2.0 tools in higher education. The findings, which showed a sharp increase in publications in 2011 and 2014 and a higher proportion of conference papers than other document types, are limited to the scope of the Scopus database and may only represent part of the landscape of Web 2.0 tool usage in higher education. However, they provide valuable insights and suggest several future research directions, including investigating the reasons for the decline in interest in Web 2.0 tools, studying the factors of its success, exploring the effectiveness of Web 2.0 tools in different subject areas, and examining their role in promoting active and collaborative learning, intercultural competence, and social justice. This bibliometric study can be helpful for policymakers and researchers interested in understanding the present Web 2.0 tool usage in higher education and improving educational practices and policies.

Keywords: *web 2.0, tertiary education, bibliometric, ICT in education, 21st century education*

Introduction

The practical applications of Web 2.0 in tertiary education are vast. These technologies enhance the effectiveness of educational materials and resources, offering more dynamic and robust online teaching and learning virtual environments. Some tools, such as blogs, Wikinews, survey builders, discussion boards, audio/video chat, RSS readers, file sharing, social media platforms, WebOffice, and interactive whiteboards, can be used by students to collaborate and communicate with their peers and teachers. Through these tools, knowledge and ideas can be shared, and various activities can be participated in, enriching the learning experience (Awang et al. 2018).

Web 2.0 provides opportunities for students and teachers to use supporting tools to enhance their teaching and learning experience. The growing popularity of Web 2.0 platforms in education has caught the attention of scholars in educational

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and information systems (Donmuş Kaya 2022). In Malaysia, the Tenth Malaysia Plan (2011-2015) was implemented to integrate information and communication technology (ICT) in teaching and learning activities, specifically blended learning approaches. As a result, higher learning institutions (HLIs) in Malaysia have started using Web 2.0 tools after the Malaysian government made a substantial investment in ICT. Web 2.0 tools usage is considered essential among educators in HLIs for teaching and learning activities.

In many developing countries, Web 2.0 tools have not been widely used by academics, although they provide advantages such as enhanced availability of educational resources and opportunities for collaborative content creation (Padayachee & Moodley 2022). However, as the Internet became prevalent, the situation gradually changed. Initially hesitant, teachers eventually incorporated Web 2.0 into higher education as its pedagogical value became apparent (Isaias et al. 2021). Students can collaborate and communicate using Web 2.0 tools, which can be influenced by their attitude and self-efficacy (Anusha & Rani 2021). While e-learning platforms and Web 2.0 technologies are prevalent in universities, not all faculty members utilize them (Esguerra 2019). This inequality in the excellent practice of Web 2.0 tools usage to meet instructional requirements explicitly highlights a loophole in its practice that requires further research.

Therefore, it is necessary to understand the current status and trends of Web 2.0 utilization in tertiary education. This paper presents a bibliometric analysis of scholarly publications on using Web 2.0 learning tools by educators in HLIs. Bibliometric analysis is a quantitative technique that examines related publications to analyze research fields' knowledge structure and progress. In this paper, the first section elucidates the significance of bibliometric analysis, whereas the subsequent section outlines the approach utilized. The third section presents the bibliometric indicators' outcomes pertinent to the research. Finally, the last section summarizes the findings, highlights potential research directions, and acknowledges certain limitations related to the topic.

Literature Review

Web 2.0 is a significant advancement in Internet technology that emphasizes interactivity, collaboration, and user-generated content. It enables users to participate in creating and sharing content without complex installations. This shift has revolutionized communication and content creation, enabling virtual communities and collaborative projects. Among the positively impacted is the educational sector that embraced Web 2.0 tools to enhance collaborative learning experiences and facilitate more active employee participation in content creation and decision-making processes (Isaias et al. 2021). Web 2.0 technologies have been found to foster interactive and collaborative learning environments, resulting in a significant improvement in the quality of education over the past decade (Aced & Toledano 2013, Alcocer-Vázquez & Zapata-González 2021, Anusha & Rani 2021, Awang et al. 2018b). In the context of the COVID-19 epidemic, where they have proven crucial in delivering interactive learning environments without time and space limits, instructors have warmly

commended the usability and educational affordance of Web 2.0 technologies (Yildirim & Gurleroglu 2022). Integrating Web 2.0 resources into educational settings is seen as a valuable pedagogical approach to enhance teaching practices and student engagement.

Similarly, Web 2.0 technologies have had a significant impact on postsecondary education (Holik et al. 2023). These technologies provide new avenues for student participation, personalized educational paths, and interactive learning. Students are now at the center of the learning process, thanks to the use of Web 2.0 tools in the classroom, which encourages cooperation and resource sharing. Indeed, several studies have shown that integrating Web 2.0 technologies in higher education enhances student engagement and performance and promotes a technologically advanced learning environment. This leads to increased usage among both instructors and students in HLIs (Isaias et al. 2021, Zakir et al. 2022). For educators, the resources provide creative methods to produce dynamic and interesting educational content for students. As evidenced by Roy (2023), teachers perceive that integrating Web 2.0 technology into their lesson plans speeds up language learning and enhances students' language skills. Furthermore, instructors' viewpoints on the usability of Web 2.0 tools have been investigated, demonstrating that educators swiftly acclimate to these technologies and perceive them as advantageous for the educational process (Aced & Toledano 2013, Awang et al. 2024, Roy 2023, Zakir et al. 2022).

Web 2.0 tools have significantly changed how students and teachers collaborate in educational settings. Wikis, blogs, and ePortfolios are examples of platforms that educators have used to improve communication and knowledge exchange (Aced & Toledano 2013, Alcocer-Vázquez & Zapata-González 2021, Anusha & Rani 2021, Awang et al. 2018a). Particularly important during situations like the COVID-19 epidemic, these platforms provide chances for content creation, distribution, and the promotion of interactive learning settings without time or space constraints (Donmuş Kaya 2022). Creative materials backed by Web 2.0 tools have been designed and developed to address science and technology teachers' issues, enhancing learning settings and encouraging significant experiences. In general, educators have embraced the incorporation of Web 2.0 tools, perceiving them as valuable resources for augmenting the educational experience and fostering cooperative learning.

With the advent of online software that engages users in various activities, Web 2.0 has wholly changed education. Accessibility, participation, cooperation, and customization are some of its most essential features. Web 2.0 enables personalization through tailored learning experiences that meet the needs of each individual. Free digital tools improve engagement by facilitating the production and exchange of student-generated products (Holik et al. 2023, Sakai et al. 2024). Teachers, students, and the community are encouraged to work together, which opens up new lines of connection. Online tools also simplify accessibility, benefiting teachers and students by streamlining education and cooperation. Teachers incorporate these tools to create dynamic, interactive learning environments that enhance the educational process.

The use of Web 2.0 technology in education has been thoroughly studied in the past. The use of Web 2.0 services to personalize students' educational trajectories and enhance individual learning (Kolyvanova et al. 2015), the general trends in using Web 2.0 tools in educational technology (Genç & Kırmızıbayrak 2024),

instructors' perceptions and challenges in incorporating Web 2.0 tools into literacy instruction (Luo et al. 2022), the usability and educational affordance of Web 2.0 tools from teachers' perspectives (Krouska et al. 2020), and the analysis of Web 2.0 in special education to identify trends and pave the way for further research (Kanbul et al. 2020) are just a few of the topics covered in these studies. When taken as a whole, these studies demonstrate how Web 2.0 tools improve student engagement, interaction, and individualized learning in classroom environments.

Methodology

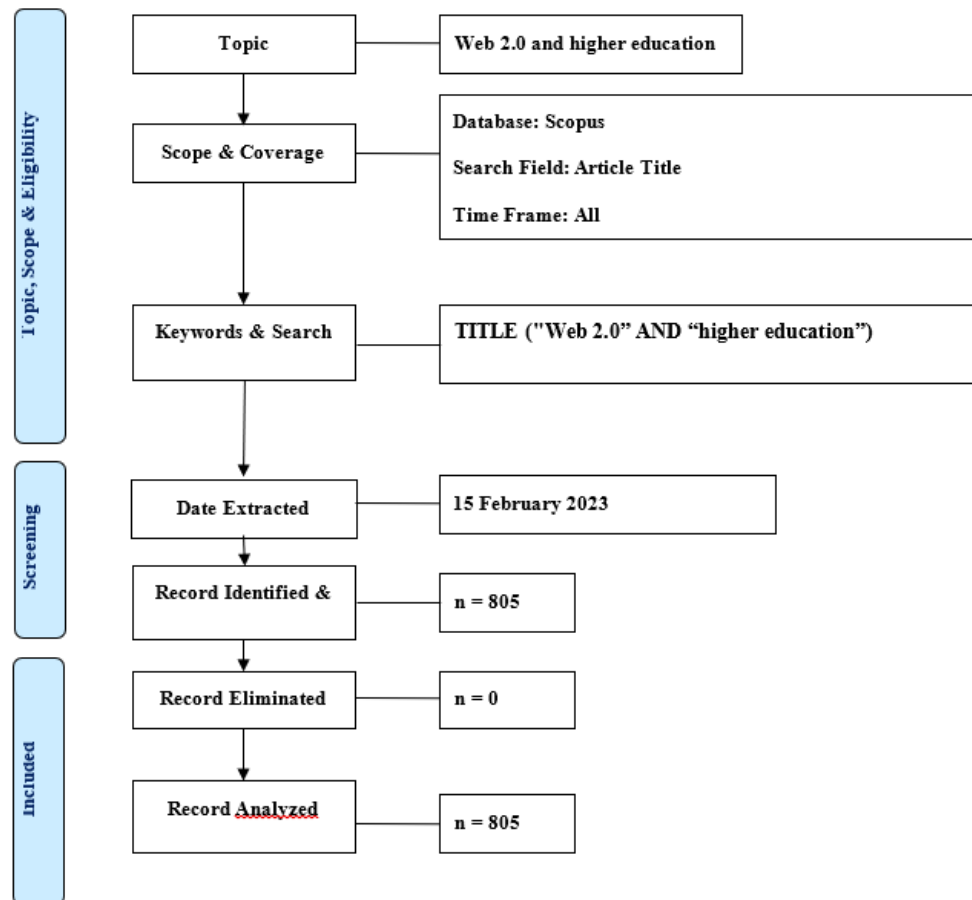
Bibliometric studies are a quantitative method used to analyze scientific and scholarly literature. Citation analysis is one of the methods used to evaluate the impact of research and identify trends in a particular field. In this study, the focus is on the literature about Web 2.0 and higher education. The paragraph discusses the methodology and results of the bibliometric study. The study retrieved 805 documents from a search query, all of which were deemed eligible and included in the study after screening. The search strategy used for this bibliometric study is shown in Figure 1. It encompasses all document types found in the Scopus database between 2006 and 2022, with a cut-off date of February 15, 2023. The search only considered the article title, suggesting that all the retrieved documents are relevant to the study's primary topic of "Web 2.0" or "higher education" literature. The document search was conducted based on keywords in the title ("Web 2.0" AND "higher education").

Results

This study provides an in-depth analysis of the research trend in higher education, focusing on the development and distribution of the usage of Web 2.0 tools among HLI around the world. The research investigates the publications based on their publication year, source, document type, and source title to provide insights into the emerging trends and patterns in the field.

Documents Profiles

Table 1 summarizes the types of documents deemed suitable and relevant for further analysis. Out of 805 documents, approximately 43% are articles, just over 35% are conference papers, and the remaining publications are distributed, as illustrated in Table 1. These documents were obtained from various sources, such as journals, conference proceedings, books, book series, and trade journals, all considered seminal publications.

Figure 1. Flowchart of the Search Strategy**Table 1.** Document Types

Document Type	Total Publications (TP)	Percentage (%)
Article	344	42.73%
Book	11	1.37%
Book Chapter	121	15.03%
Conference Paper	285	35.40%
Conference Review	18	2.24%
Editorial	3	0.37%
Note	1	0.12%
Review	21	2.61%
Short Survey	1	0.12%
<i>Total</i>	<i>805</i>	<i>100.00</i>

Table 2 shows that the documents were primarily written in English, with around 94.22% of publications using this language. Spanish and Portuguese came in second and third, representing 4.18% and 0.86% of the publications, respectively. The remaining languages, German, Arabic, Chinese, Croatian, and Turkish, each comprised 0.25% or less of the publications.

Table 2. Languages of Publications

Language	Total Publications (TP)*	Percentage (%)
Arabic	1	0.12%
Chinese	1	0.12%
Croatian	1	0.12%
English	766	94.22%
German	2	0.25%
Portuguese	7	0.86%
Spanish	34	4.18%
Turkish	1	0.12%
Total	805	100.00

Pertaining to the publications' subject areas, Table 3 shows that Social Sciences has the highest number of publications, comprising 66.46% of the total. Computer Science follows closely behind with 54.16% of the publications. Other subject areas with a significant number of publications include Business, Management, and Accounting (8.07%), Engineering (10.43%), Mathematics (5.47%), and Arts and Humanities (4.60%). The remaining subject areas have a much smaller percentage of publications, with some having only one or two.

Table 3. Publication Subject Areas

Subject Area	Total Publications (TP)	Percentage (%)
Social Sciences	535	66.46%
Psychology	22	2.73%
Physics and Astronomy	3	0.37%
Pharmacology, Toxicology and Pharmaceutics	3	0.37%
Nursing	5	0.62%
Neuroscience	2	0.25%
Medicine	9	1.12%
Mathematics	44	5.47%
Materials Science	1	0.12%
Immunology and Microbiology	1	0.12%
Health Professions	5	0.62%
Environmental Science	7	0.87%
Engineering	84	10.43%
Energy	4	0.50%
Economics, Econometrics and Finance	18	2.24%
Earth and Planetary Sciences	2	0.25%
Dentistry	1	0.12%
Decision Sciences	28	3.48%
Computer Science	436	54.16%
Chemistry	1	0.12%
Business, Management and Accounting	65	8.07%
Biochemistry, Genetics and Molecular Biology	1	0.12%
Arts and Humanities	37	4.60%
Agricultural and Biological Sciences	2	0.25%

Research Trend

The distribution of published articles over the years is presented in Table 4, which shows that the highest publications on Web 2.0 in higher education were in 2012, accounting for 12.17% of the total publications since 2006. The data reveals a rising trend in the number of publications starting from 2006, with a decline observed in 2013 and continuing until recent years (2022). This trend may indicate a decreased interest among researchers in Web 2.0 tools in higher education. However, it is noteworthy that the concept has regained momentum since the outbreak of the COVID-19 pandemic.

Table 4. *Year of Publication*

Year	TP	NCP	TC	C/P	C/CP	h	g
2022	10	1	1	0.10	1.00	1	1
2021	13	11	26	2.00	2.36	3	3
2020	24	20	252	10.50	12.60	9	15
2019	41	25	184	4.49	7.36	6	12
2018	39	31	213	5.46	6.87	9	13
2017	40	31	289	7.23	9.32	10	15
2016	47	37	505	10.74	13.65	13	21
2015	57	45	420	7.37	9.33	11	18
2014	67	52	706	10.54	13.58	13	25
2013	77	62	1753	22.77	28.27	17	41
2012	98	82	2404	24.53	29.32	17	48
2011	84	65	1101	13.11	16.94	15	32
2010	85	66	1536	18.07	23.27	18	38
2009	72	55	1084	15.06	19.71	15	32
2008	36	32	887	24.64	27.72	14	29
2007	11	8	312	28.36	39.00	4	11
2006	4	1	3	0.75	3.00	1	1
<i>Total</i>	<i>805</i>						

The following metrics are commonly used to evaluate academic publications: total number of publications (TP), number of cited publications (NCP), total citations (TC), average citations per publication (C/P), average citations per cited publication (C/CP), h-index, and g-index.

As revealed by Table 5, Malaysia has the highest number of publications, with nine institutions producing 24 publications. Australia comes in second with 22 publications produced by six institutions. The USA has 18 publications from 3 institutions, while Taiwan and China each have 20 and 17 publications from four and three institutions, respectively. The institutions with the highest publications are Universidad de Salamanca (Taiwan), with 13 publications; Monash University (USA), with 11 publications; and the University of Melbourne (China), with ten publications. The total number of publications for each country is included in a separate section, where Malaysia has the highest total with 24 publications, followed by Australia with 22 publications.

Table 5. *Most Dominant Institutions with More Than Seven Publications*

Affiliation	Country	TP
Australian Catholic University	Malaysia	9
Deakin University	Malaysia	7
Universiti Teknologi Malaysia	Malaysia	7
Universidade Aberta	Malaysia	8
Universidad de Sevilla	Australia	8
University of Plymouth	Australia	7
Monash University	USA	11
Universidad de Murcia	USA	7
Universidad de Salamanca	Taiwan	13
University of the West of Scotland	Taiwan	8
UNITEC Institute of Technology	Taiwan	7
University of Melbourne	China	10
The Open University	China	7
Universidade de Aveiro	Hong Kong	8
Universitat Rovira i Virgili	Hong Kong	7

Next, Table 6 lists authors, their affiliations, countries, and the number of publications they have contributed. Cochrane, T. has the highest number of publications with nine, followed by Waycott, J., Ebner, M., García-Peñalvo, F.J., Gillet, D., Gray, K., Grosch, M., Kennedy, G., Lee, M.J.W., and Miranda, P., each with five publications. These authors come from different countries and institutions, including universities and educational computing associations.

Table 6. *Most Productive Authors*

Author's Name	Affiliation	Country	TP
Cochrane, T.	Centre for Teaching and Learning Innovation, Unitec	New Zealand	9
Waycott, J.	Cardiff University	UK	7
Ebner, M.	Universidad Nacional Mayor San Marcos	Peru	6
García-Peñalvo, F.J.	Computer Science Department/Science Education Research Institute/GRIAL Research Group, University of Salamanca	Spain	5
Gillet, D.	Ecole Polytechnique Fe´de´rale de Lausanne (EPFL)	Switzerland	5
Gray, K.	School of Medicine and Department of Information Systems, The University of Melbourne	Australia	5
Grosch, M.	Association for the Advancement of Computing in Education	Germany	5
Kennedy, G.	University of Melbourne	Australia	5
Lee, M.J.W.	Charles Sturt University	Australia	5
Miranda, P.	Escola Superior de Tecnologia de Setúbal, IPS, Campus do IPS, Estefanilha	Portugal	5

Table 7 provides an overview of the most active source titles, categorized based on the total number of publications. Social Sciences is the leading category with 535

publications, followed by Computer Science with 436 publications, Engineering with 84 publications, Business, Management, and Accounting with 65 publications, and Mathematics with 44 publications. Conversely, other categories such as Decision Sciences, Arts and Humanities, Econometrics, Psychology and Economics, and Finance each contribute fewer than 30 publications. This comprehensive breakdown highlights the prominence of specific disciplines in the scholarly landscape, offering valuable insights into the distribution of publications across various academic domains.

Table 7. *Most Active Publication Titles*

<i>Source Title</i>	<i>TP</i>
Social Sciences	535
Psychology	22
Mathematics	44
Engineering	84
Economics, Econometrics and Finance	18
Decision Sciences	28
Computer Science	436
Business, Management and Accounting	65
Arts and Humanities	37

Citation Analysis

Table 8 provides a citation analysis that includes 805 papers with a total of 11,676 citations over 17 years, resulting in an average of 686.82 citations per year. The average number of citations per paper is 14.50. The h-index, which measures an author's productivity and impact, is 52, while the g-index, which considers the distribution of citations among papers, is 90. The table shows the top nine papers in education and technology, classified by the total citations received. The papers cover various topics such as digital reading practices, e-learning, web 2.0 tools in higher education, and the impacts of the COVID-19 pandemic on distance education. The paper with the highest number of citations is by (Tawafak et al., 2021), with four citations, followed by six papers, three and two, with one citation each. The table also includes the number of citations per year, which indicates the papers' impact over time.

Table 8. *Highly Cited Articles*

Authors	Title	Cites	Cites per Year
(Alcocer-Vázquez & Zapata-González 2021)	Digital reading practices among social science and exact science university students	3	1.5
(García-Martínez 2021)	Tools linked to informal learning: Opportunities to strengthen personal learning environments of university students during the times of pandemic	3	1.5
(Hernández Suárez et al. 2021)	Strategic technological management: Use of the Social Web 2.0 ecosystem in higher education	2	1
(Isaías et al. 2021)	Framework for Web 2.0 implementation in higher education: Experts' validation	3	1.5
(Küçük-Avci et al. 2022)	The Effects of the Covid-19 Pandemic on Distance Education in Higher Education: A Bibliometric Analysis Study	1	1
(Li & Wong 2021)	The Opportunities and Challenges of Social Media in Higher Education: A Literature Review	1	0.5
(Shire & McKinney 2021)	Web 2.0 tools and information literacy instruction in UK university libraries: Hype or reality?	2	1
(Sivankalai 2021)	Academic Libraries support E-Learning and Lifelong Learning: A case study	1	0.5
(Tawafak et al. 2021)	Integration of TAM and MOOC for e-learning purposes	4	2
(Tomasena 2021)	Who are the booktubers? Characteristics of Spanish-language Literary Video Bloggers	3	1.5

Table 9 shows the number of authors per document in a particular dataset. The total number of publications analyzed in the dataset was 101. Most publications were authored by either one (26.09%) or two (34.04%) authors. Only a small percentage of publications had more than five authors, with the highest being 12 (0.12%). There were also 20 publications (2.48%) with no authors listed.

Table 9. Number of Authors (S) Per Document

Total Publications (TP)	Author Count	Percentage (%)
210	1	26.09%
274	2	34.04%
168	3	20.87%
68	4	8.45%
42	5	5.22%
12	6	1.49%
6	7	0.75%
2	8	0.25%
1	9	0.12%
1	11	0.12%
1	12	0.12%
20	0	2.48%
<i>Total</i>	-	100.00%

*Conference review document. No author is listed.

Keywords

Table 10 lists author keywords, their total publications (TP), and their percentage in descending order based on TP. The keyword "Web 2.0" has the highest TP with 369 publications, followed by "Higher Education" with 299 publications. The top 15 keywords have TPs ranging from 369 to 40, while the remaining have TPs of 19 or less. The list includes many keywords related to education, technology, and social media, reflecting the growing interest in these areas.

Table 10. Top Keywords

Author Keywords	Total Publications (TP)	Percentage (%)
Web 2.0	369	45.84%
Higher Education	299	37.14%
Students	187	23.23%
E-learning	171	21.24%
Teaching	143	17.76%
World Wide Web	129	16.02%
Education	119	14.78%
Social Networking (online)	102	12.67%
Engineering Education	86	10.68%
Computer Aided Instruction	65	8.07%
Web 2.0 Technologies	53	6.58%
Social Media	51	6.34%
Collaborative Learning	48	5.96%
Learning	44	5.47%
Higher Education Institutions	40	4.97%

The author's keywords were also counted as essential to reflect the associated issues in Web 2.0 utilization in tertiary education studies. The web visualization of author keywords was shown using VOSviewer. It is important to note that features like color, font size, circle size, and connecting line thickness are indicators used to

sharp increase in publications during specific years, particularly in 2011 and 2014, and a higher proportion of conference papers than other types of documents. Additionally, the study found that computer science had the highest number of publications, comprising 54.16% of the total.

This study comprehensively overviews the development and distribution of Web 2.0 tool usage in tertiary education. It contributes to existing literature by identifying popular subject areas and document types and providing insights into publication trends. The study also identifies the dominant language used in the field, which may affect international collaboration and communication. Based on the findings, several future research directions have been identified. First, investigating the reasons behind the decline in interest in Web 2.0 tools in higher education in recent years is essential. It may be worth investigating whether this decline is due to a saturation of the field, a shift in focus to other technologies, or a lack of perceived value in Web 2.0 tools.

Additionally, exploring the effectiveness of Web 2.0 tools in different subject areas and the factors influencing their adoption and success is another critical area for future research, given the shift towards open distance learning in tertiary education. This, in turn, is expected to support the agenda of Education Revolution 4.0. The role of Web 2.0 tools in promoting active and collaborative learning in higher education is also an exciting area for future research. Furthermore, research could explore how Web 2.0 tools can foster intercultural competence and global learning. Finally, examining the ethical and social implications of Web 2.0 tool usage in higher education is essential.

Future research in Web 2.0 and artificial intelligence can explore integrating these technologies to enhance the teaching and learning experience. With the increasing use of AI in education, researchers can study the effectiveness of AI-powered tools in providing personalized learning experiences to students. Additionally, research can investigate the use of AI in creating intelligent tutoring systems that can provide students with feedback and guidance based on their individual needs.

Another area of future research could be examining the ethical implications of using AI-powered Web 2.0 tools in education. As AI-powered tools become more prevalent, it is essential to understand their impact on student privacy, data protection, and bias. Researchers can explore how to ensure that these tools are used ethically and in a way that benefits all students, regardless of their background. In conclusion, future research in Web 2.0 and artificial intelligence can significantly benefit the education sector by providing insights into how to use these technologies to enhance teaching and learning while also addressing ethical concerns.

However, it is essential to note the limitations of this study, including the fact that it only covers documents published in the Scopus database and did not differentiate between the quality of the publications. Future research could improve the findings by exploring more databases, such as Google Scholar and Web of Science. In conclusion, this bibliometric study provides valuable insights into developing and distributing Web 2.0 tool usage in higher education. The study highlights the high interest in the topic across various document types, the dominance of the English language in the field, and the popularity of Computer Science and Social Sciences as the most prominent subject areas. These findings

can be helpful for policymakers and higher education researchers interested in understanding the current state of Web 2.0 tool usage in this domain. The study also reveals interesting trends and areas for future research, including the decline in interest in Web 2.0 tools in recent years and the potential for exploring their role in promoting active and collaborative learning, intercultural competence, and social justice. Pursuing these research areas can contribute to the ongoing evolution and improvement of higher education practices and policies.

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